AMENDMENTS TO THE CLAIMS

The listing of claims below replaces all prior versions of claims in the application.

Claims 1-19 (Canceled)

Claim 20 (Currently Amended): An electrolytic apparatus for producing an electrically conductive nano-wire comprising:

two electrodes,
a voltage control device for controlling the voltage applied across the two electrodes,
an electrolytic cell for holding an electrolyte and the two electrodes, wherein
the gap between the two electrodes is from 1 nm to 100 μm, and
the electrically conductive nano-wire is produced between the two electrodes or above the two electrodes, by allowing the electrolytic cell to hold an electrolyte containing molecules that [[is to]] constitute an electrically conductive nano-wire, and generate a gradient of voltage between the two electrode by applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact.

Claim 21 (Previously presented): The electrolytic apparatus for producing an electrically conductive nano-wire according to claim 20, characterized in that the two electrodes are formed on a substrate.

Claim 22 (Currently Amended): An electrolytic apparatus for producing an electrically conductive nano-wire comprising:
two electrodes facing each other, and formed on a substrate,

an electrolytic cell for holding an electrolyte and the substrate, and

a voltage control device connected to the two electrodes for controlling the voltage applied across the two electrodes, wherein

the electrolytic cell comprises:

an electrolyte holder section for holding the electrolyte, and

a substrate plug section for plugging the substrate,

the two electrodes have respective protrusions located either between both ends of each electrode and extending toward the other electrode, or on one end of each electrode and extending toward the other electrode by bending the each electrode at the one end;

the gap between the closest sites of the two electrodes formed on the substrate is from 1 nm to 100 μm; and

the electrically conductive nano-wire is produced between the two electrodes or above the two electrodes, by allowing the electrolytic cell to hold an electrolyte containing molecules that [[is to]] constitute an electrically conductive nano-wire, and generate a gradient of voltage between the two electrodes by applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact..

Claim 23 (Previously presented): The electrolytic apparatus for producing an electrically conductive nano-wire according to claim 22, wherein

each end of the protrusions of the two facing electrodes faces each other in parallel, or is tapered as approaching the other protrusion; and the two electrodes have an insulated portion covered with an insulator; and

the site of the substrate plug section exposing the substrate when the substrate is plugged in the substrate plug section is covered with an insulator.

Claim 24 (Previously presented): An electrolytic apparatus for producing an electrically conductive nano-wire comprising:

a substrate, a gate electrode formed on the substrate, an insulating layer covering the gate electrode, two facing electrodes formed on the insulating layer;

an electrolytic cell for holding the electrolyte and the substrate; and

a voltage control device connected to the gate electrode and two electrodes for controlling the voltages applied across the gate electrode and two electrodes; wherein

the electrolytic cell includes:

an electrolyte holder section for holding the electrolyte, and

a substrate plug section for plugging the substrate;

the site of the substrate plug section exposing the substrate when the substrate is plugged in the substrate plug section is covered with an insulator;

the two electrodes have respective protrusions located either between both ends of each electrode and extending toward the other electrode, or on one end of each electrode and extending toward the other electrode by bending the each electrode at the one end;

each end of the protrusions of the two facing electrodes faces each other in parallel, or is tapered as approaching the other protrusion;

the two electrodes have an insulated portion covered with an insulator;

the gap between the closest sites of the two electrodes formed on the substrate is from 1 nm to 100 μm;

the electrically conductive nano-wire is produced between the two electrodes or above the two electrodes, by allowing the electrolytic cell to hold an electrolyte containing molecules that is to constitute an electrically conductive nano-wire, and generate a gradient of voltage between the two electrodes by applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact.

25 (Withdrawn): A method of fabricating an electrolytic apparatus for forming an electrically conductive nano-wire, the apparatus comprising:

two electrodes facing each other formed on a substrate,

an electrolytic cell for holding an electrolyte and the substrate, and

a voltage control device connected to the two electrodes through electrode lines for controlling the voltage applied across the two electrodes, the method comprising:

a step for forming electrodes having a gap of from 1 nm to 100 μm between them on the substrate, by:

a metallic-film forming step for forming a metallic film on the substrate;

a resist layer forming step for forming a resist layer on the metallic film vapor-deposited in the metallic-film forming step;

a light exposure step for exposing the resist layer formed in the resist layer forming step to a desired pattern;

a developing step for developing the resist layer exposed in the light exposure step; and

an etching step for etching the metallic film using the resist layer left after the developing step as a mask; wherein

the electrically conductive nano-wire is produced between the two electrodes or above the two electrodes, by allowing the electrolytic cell to hold an electrolyte containing molecules that is to constitute an electrically conductive nano-wire, and generate a gradient of voltage between the two electrodes by applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact.

26 (Withdrawn): A method of fabricating an electrolytic apparatus for forming an electrically conductive nano-wire, the apparatus comprising:

two electrodes facing each other, and formed on a substrate,

an electrolytic cell for holding an electrolyte and the two electrodes, and

a voltage control device connected to the two electrodes through electrode lines for controlling the voltage applied across the two electrodes; the method comprising:

a step for forming electrodes having a gap of from 1 nm to 100 μm between them on the substrate, by:

a metallic-film forming step for forming a metallic film on the substrate;

a resist layer forming step for forming a resist layer on the metallic film vapor-deposited in the metallic-film forming step;

an electron beam radiating step for radiating electron beams onto the resist layer formed in the resist layer forming step to a desired pattern;

a developing step for developing the resist layer irradiated in the electron beam radiating step; and

an etching step for etching the metallic film using the resist layer left after the developing step as a mask; wherein

the electrically conductive nano-wire is produced between the two electrodes or above the two electrodes, by allowing the electrolytic cell to hold an electrolyte containing molecules that is to constitute conductive nano-wire, and generate a gradient of voltage between the two electrodes by applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact.

27 (Withdrawn): A method of fabricating an electrolytic apparatus for forming conductive nano-wire, an apparatus comprising:

two electrodes facing each other formed on a substrate,

an electrolytic cell for holding an electrolyte and the substrate, and

a voltage control device connected to the two electrodes through electrode lines for controlling the voltage applied across the two electrodes; the method comprising:

a step for forming electrodes having a gap of from 1 nm to 100 μm between them on the substrate, by:

a metallic-film forming step for forming a metallic film on the substrate;

a photoresist layer forming step for forming a photoresist layer on the metallic film vapor-deposited in the metallic-film forming step;

a light exposure step for exposing the photoresist layer formed in the photoresist layer forming step to a desired pattern;

a first developing step for developing the photoresist layer exposed in the light exposure step;

a rough electrode-form forming step for forming a rough form of the electrode on the substrate by the step including a first etching step for etching the metallic film using the photoresist layer left after the first developing step as a mask;

an electron beam resist layer forming step for forming an electron beam resist layer on the rough form of the electrode formed in the rough electrode-form forming step;

an electron beam radiating step for radiating electron beams onto the electron beam resist layer formed in the electron beam resist layer forming step to a desired pattern;

a second developing step for developing the electron beam resist layer irradiated in the electron beam radiating step; and

a second etching step for etching the metallic film using the electron beam resist layer left after the second developing step as a mask; wherein

the conductive nano-wire is produced between the two electrodes or above the two electrodes, by allowing the electrolytic cell to hold an electrolyte containing molecules that is to constitute conductive nano-wire, and generate a gradient of voltage between the two electrodes by applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact.

28 (Withdrawn): A method of forming an electrically conductive nano-wire to form conductive nano-wireby allowing an electrolytic cell to hold an electrolyte containing molecules that is to constitute an electrically conductive nano-wire , and applying a voltage across the two electrodes in the state wherein the electrolyte and the two electrodes are in contact; comprising:

an electrode adjusting step for adjusting the gap between the two electrodes to from 1 nm to 100 μm;

an electrode mounting step for mounting the two electrodes onto the electrolytic cell;

an electrolyte preparing step for dissolving the molecule(s) that constitute an electrically conductive nano-wire in an organic solvent;

an electrolyte injecting step for injecting the electrolyte into the electrolytic cell; and

an electrolyzing step for applying an electric current of 1 nA to 1 mA across the two electrodes for a period of 10 days or below to make the potential difference between the two electrodes 10 mV to 20 V.

29 (Withdrawn): The method of forming an electrically conductive nano-wire according to claim 28, wherein the voltage to be applied is an AC voltage.

30 (Withdrawn): An electrically conductive nano-wire having a width between the size of one constituent molecule to 1 μm, and a length of 1 nm to 500 μm, and comprising molecules that can aggregate by self-assembly by interaction for movement of charge as the constituent molecule.

31 (Withdrawn): An electrically conductive nano-wire according to claim 30, wherein the electrically conductive nano-wire having a width between the size of one constituent molecule to 1 μm,

and a length of 1 nm to 500 μm,

and comprising TTF derivatives, dmit complexes, porphyrin complexes or phthalocyanines as the constituent molecule.

32 (Withdrawn): A electrically conductive nano-wire according to claim 30 or claim 31, wherein the conductivity of the electrically conductive nano-wire is 1 $S \cdot cm^{-1}$ or more.

33 (Withdrawn): A method of fabricating an electrically conductive nano-wire containing a molecular assembly of a diameter of 1 nm to 1 μm and a length of 1 nm to 500 μm using an electrolyte containing an organic conductor having π-electrons, comprising:

a step for fabricating the molecular assembly by applying a DC voltage and/or an AC voltage having the maximum potential difference of 10 mV to 20 V for 1 second to 10 days across the two electrodes having a gap between the closest sites of the two electrodes of from 1 nm to 100 μm.

34 (Withdrawn): The method of fabricating an electrically conductive nano-wire according to claim 33, wherein the molecular assembly that is produced by the step for fabricating the molecular assembly is a molecular assembly that contains molecules that can aggregate self-assembly by interaction for movement of charge as the constituent molecule.

35 (Withdrawn): The method of fabricating an electrically conductive nano-wire according to claim 33, wherein the organic conductor having π-electrons is a cyanocobalt complex of phthalocyanine.

36 (Withdrawn): The method of fabricating an electrically conductive nano-wire according to claim 33, wherein the organic conductor having π-electrons is tetraphenyl phosphonium dicyanocobalt (III) phthalocyanine, and the conductivity of the molecular assembly is 1 $S \cdot cm^{-1}$ or more.

37 (Withdrawn): A method of fabricating an electrically conductive nano-wire using an electrolytic apparatus comprising:

two electrodes facing each other, and formed on a substrate,

an electrolytic cell for holding an electrolyte and the substrate, and

a voltage control device connected to the two electrodes, for controlling a voltage applied to the two electrodes; wherein

the electrolytic cell includes:

an electrolyte holder section for holding the electrolyte, and

a substrate plug section for plugging the substrate;

the site of the substrate plug section exposing the substrate when the substrate is plugged in the substrate plug section is covered with an insulator;

the two electrodes have respective protrusions located either between both ends of each electrode and extending toward the other electrode, or on one end of each electrode and extending toward the other electrode by bending the each electrode at the one end;

each end of the protrusions of the two facing electrodes faces each other in parallel, or is tapered as approaching the other protrusion;

the two electrodes have an insulated portion covered with an insulator; and

the gap between the closest sites of the two electrodes formed on the substrate is from 1 nm to 100 μm;

the method comprising a step for forming a molecular assembly having a diameter of 1 nm to 1 μm and a length of 1 nm to 500 μm, by allowing the electrolytic cell to hold an electrolyte containing tetraphenyl phosphonium dicyanocobalt (III) phthalocyanine, which are molecules that are to constitute a molecular assembly, and acetonitrile; and

applying a DC voltage and/or an AC voltage having the maximum potential difference across two electrodes of 10 mV to 20 V across the two electrodes for 0.001 seconds to 10 days in the state wherein the electrolyte and the two electrodes are in contact.

38 (Withdrawn): The method of forming an electrically conductive nano-wire according to claim 37, wherein the voltage to be applied is an AC voltage.

39 (Withdrawn): A method of fabricating an electronic circuit comprising:

a step for exposing the gap of an electronic circuit ranging from 1 nm to 100 μm to an electrolyte containing an organic conductor having π-electrons; and

a step for applying a voltage across the electronic circuit, and filling the gap using a conductive molecular assembly produced in the gap.

40 (Withdrawn): A method of fabricating an electronic circuit having a connecting portion of a conductive molecular assembly, comprising a step for exposing an electronic circuit having a gap of from 1 nm to 100 μm to be filled by the conductive molecular assembly to an electrolyte containing an organic conductor having π-electrons; and

a step for filling the gap using the conductive molecular assembly produced in the gap.

41 (Withdrawn): A method of fabricating an electronic circuit having a connecting portion of a conductive molecular assembly, comprising a step for exposing an electronic circuit having a gap with the distance of one to ten molecules to be filled by the conductive molecular assembly to an electrolyte containing an organic conductor having π-electrons; and

a step for filling the gap using the conductive molecular assembly produced in the gap.